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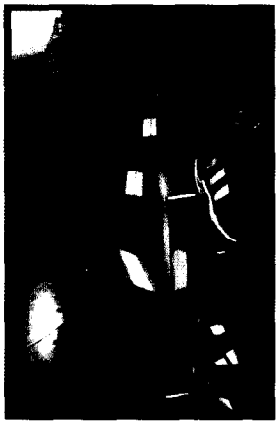
Light emitting diodes captured the interest of hundreds of lighting designers at LightFair International 2002, held June 1-5 in San Francisco, CA. Billed as a trade show with a timely focus on energy efficiency, LEDs fit the theme perfectly. More than 17,000 architects, electrical and illumination engineers, lighting and interior designers, academics and procurement professionals perused 115,000 sf of show space. Of approximately 450 exhibiting manufacturers, at least 50 offered LEDs or LED-related services.

LEDs Focus Design Interest at LightFair 2002

Adidas' flagship retail store in Stockholm, Sweden features Color Kinetics wall washers



Educating and Partnering

Although LEDs neatly conquered some lighting niches in North America, particularly exit signs and traffic signals, until this year most lighting designers regarded them as pragmatic, monochromatic energy-savers. However, news of recent technical breakthroughs in high brightness white LEDs put designers on alert for ways to incorporate LEDs into more mainstream applications.

LED manufacturers realize that LEDs are a mysterious light source to most lighting designers. Beyond tangible LED products, designers hunger for reliable information and guidance. To meet this need, two LightFair workshops featured LEDs. One focused on technology and applications, the other on product evaluation, performance and market factors. Both were standing room only events, drawing a combined total of over 300 attendees, most of whom self-identified as designers. The first, "LED Technology," featured in-depth presentations by Labsphere Inc, LED Consulting, Osram Sylvania, Inc and Permlight. The second included speakers from Rensselaer Polytechnic Institute and the Lighting Research Office.

Workshop audiences were keen to learn how to specify components, create appropriate circuits and drivers, and extract the greatest light possible from LED systems. Much concern was expressed about the quality of so-called "white" light. The art and science of illumination demands detailed measures of color rendering, color temperature, color shift and maintenance of light output over the life of the device. In keeping with the theme of energy efficiency, many questions centered on how to: measure efficacy, compare LEDs with broader-spectrum light sources, and predict maintenance and life cycle costs. Attendees clearly wanted more details on product reliability and independent product performance evaluations, too.

Along with the energy efficiency queries from end-users and electric utilities came challenges from the press and government entities about environmental impacts, undoubtedly prompted by recent and pending legislation regarding mercury and lead use and disposal in other lighting technologies. Representatives of the Solid State Lighting Section of the National Electrical Manufacturers Association acknowledged the need for more information on this topic. Given the great promise for energy savings and innovation, presenters encouraged the participants to support federal efforts for $50 million for solid state lighting research, outlined in proposed energy legislation as "The Next Generation Lighting Initiative."

The seemingly endless variety and special requirements of LEDs could easily bewilder a semiconductor novice. To bring customers further along the learning curve, die and component manufacturers are making the effort to offer educational materials. Uniroyal Optoelectronics prepared a comprehensive folder of application engineering and technical notes for show-goers, while LEDtronics Inc. posted several informational videos to its website. Most LED device manufacturers appear to be offering more detailed specification sheets; although these lack standard format and metrics, some have glossaries. The

lighting community is accustomed to using product described in photometric terms, so instrument companies such as Labsphere Inc have developed comprehensive guides to explain the radiometric descriptors more common to LEDs

From a designer's perspective, LEDs are crossing the bridge from the realm of science into the realm of the possible. Putting LED lighting into a building or public space means that the devices must be accessible to electrical contractors. LEDs coming from the semiconductor industry do not flow easily into the building industry, despite several prominent R&D joint ventures with major lighting manufacturers. Thus strategic sales partnerships are essential for bringing them into the conventional lighting distribution channels. For example, TIR Systems Ltd is partnering with LumiLeds Lighting LLC to globally distribute Chip Strip neon-replacement products. Similarly, Targetti has teamed up with Color Kinetics to incorporate Chromacore technology in new luminaire products.

Solid State Awards and Product Introductions

Designers-well informed by the workshops-set out to identify and price LED products that could distinguish their next project from the competition. LumiLeds Lighting LLC won the show's best of category award for specialty lamps for its 5-watt Luxeon Star, a brilliant, tiny source producing 120 lumens of white, green or cyan light. Available with secondary optics, a small footprint and sophisticated thermal management, this winner attracted serious attention from luminaire manufacturers. It is also available in two sizes of ring configurations. To make it easier for creative types to experiment with Luxeon, LumiLeds teamed up with distributor Future Electronics to offer "designer kits" with a variety of ready to use system components. Employing a marketing strategy that appeals to risk aversive and perpetually busy lighting professionals, LumiLeds also is taking to road, staging daylong, hands-on workshops in major U.S. and European cities.

Also appealing to those seeking high brightness was Norlux Corp, offering chip-on-board Hex Monochromatic High Performance LED Modules, each producing up to 125 lumens. Another purveyor of bright light in a small package is Bruck Lighting Systems, claiming that its Orion Series modules are equivalent to a 20-25W incandescent lamp. Other LED exhibitors showed a huge diversity of standard and custom component LEDs, including American Bright Optoelectronics Corp, Color LED Inc, LEDtronics, Inc, LeoTek Electronics USA Corp, Opto Tech Corp, Oriol, Inc and SUNLED Corp. The highest barrier to their products being adopted by luminaire designers is their unfamiliarity with the operating and environmental requirements of various LEDs. Two electronics companies addressing this problem are: Advance Transformer Co which featured the Xitanium series of LED drivers, and Lightech Electronics North America Inc with its 25 watt transformer accepting input from 90 to 250 volts.

Times Square, New York, New York is home to millions of LEDs in its signs

A Dynamic Message for the Market

The new market drivers for the LED lighting industry appear to large-scale video signs, coupled with what seems like a predictable shift away from neon and towards LEDs in the channel letter and linear accent lighting niches. These products demand huge numbers of LEDs, and already cover acres of building facades in high-profile venues such as Times Square, NY and Las Vegas, NM. A recent poll of sign companies in the U.S. revealed that LED signs represent only four percent of the existing market; this leaves tremendous room for growth. Act One Communications, Inc exhibited a wide variety of dynamic LED signs, including monochromatic messaging systems and full-color streaming video displays.

Ready to seize this opportunity, GELcore introduced flexible strings of LED modules. Their Tetra LED channel lighting system, available in white and other typical channel letter colors are Underwriters Laboratory listed for electrical

The Atrium Bar at the Marriott Hotel, New York, New York features Color Kinetics products.

safety, and engineered for easy on-site installation. Osram Sylvania showcased LINEARlight FLEX, in either a SIDELED or TOPLED configuration, the former useful for letters that "float" on an illuminated portion of a façade, the latter for channel letters with transparent faces. Competitors SloanLED and Permlight target the outdoor sign market, so prevalent in retail-saturated suburban areas. California electric utility regulators have even stepped into the competitive fray to encourage higher efficiency lighting systems for signage. California purchasers who replace neon in channel letters with LEDs may cash in on rebate incentives. Consequently, neon sign manufacturers are literally "seeing red," not because only the red sources qualify for the rebate, but because they see the writing on the wall for the possible demise of handcrafted neon.

Dynamic, programmable color displays are blurring the boundaries between architecture and entertainment, enhancing the look that evokes holiday theme parks and casino lifestyles. Leading the way in marketing this "architainment" trend at LightFair is Color Kinetics Inc. Their low-voltage iColor Accent linear light comes in several lengths and can be used indoors or outdoors. It garnered one of six premier honors, the Roeder Award. Each one-foot length can be separately addressed by a digital controller such as the iPlayer2. For wall wash effects, their ColorBlast6 fixture gives retailers many options for positioning and color. Color Kinetics has teamed up with TIR Systems Ltd to achieve broader distribution, especially for outdoor architectural accents and public area installations. Lest the lighting purchaser be faced with only one purveyor of splashy effects, Bright Lighting LLC, a new entrant, introduced Color Stream, meant to simulate a linear fluorescent tube, but with preprogrammed patterns that advance along a chain of units.

To the relief of anyone eager for energy efficiency but not fond of a visual scene pulsing perpetually with saturated color, other lighting purveyors have begun to incorporate LEDs into more mundane spots, such as staircases and walkways. Recessed fixtures are hard to reach but walkways and stairs are perilous without good lighting. Thus LEDs are a perfect solution for maintenance-conscious customers. As the cost of LED devices decline, this niche market will quickly step away from incandescent sources. Displaying luminous step lights was Vista Professional Outdoor Lighting. For low light levels where color-keyed guidance is a plus, Erco Lighting Inc introduced a split view fixture: the top half has a color LED for orientation, the bottom half uses a white LED to illuminate walking surfaces. Lumenyte International Corp gives designers the option of continuous lengths of even brightness with the StarBurst Solid State Fiber Optic Lighting System, incorporating LEDs. To keep a firm grip on descent, designers might choose Tempo Industries Inc low-voltage Sentinel Rail Light which can be installed directly in handrails, and features replaceable LEDs.

Back to the Drawing Board

Surprisingly, LEDs did not figure prominently in mainstream luminaires for interiors. Evidently previous concerns about quality, brightness and reliability, combined with barriers such as lack of well-known distributors left LEDs out of new product introductions. Even so, 2002 marks the point at which LEDs have captured the imagination of lighting designers. LED manufacturers appear ready to provide ample technical information, application guidance and easier access to LED products for prototyping. Given another year, lighting innovators could surprise the LightFair crowds in New York City, 5 May to 8 May, 2003. In addition to new entrants in the LED lamp and linear/edge lighting niches, expect to see more conventional lighting fixture manufacturers venture into the solid state arena with office task lights, undercabinet lights, wall sconces, edge-lit decorative trims, and luminous display furnishings for retail merchandisers.

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